Foreword

The Multi-Tester plus/pro software cassette is the component that gives the diagnostic equipment its unique test characteristics: all data required to make the test system operate is stored in the software cassette.

The software cassette can be easily replaced enabling the Multi-Tester plus/pro to be rapidly adapted to the trouble-shooting job at hand.

These Trouble-Shooting Instructions describe how to use the equipment on Siemens/Bendix fuel injection system type Fenix/Renix 35.

Multi-Tester plus/pro checks all input and output signals that have a bearing on the control system. It can also diagnose a faulty control unit.

Contents

System Description

General

Fenix/Renix 35 is a combined control system for fuel injection and ignition. It determines fuel supply, principally with the aid of a pressure sensor on the inlet manifold which measures engine load. The value is corrected by the airtemperature sensor.

The system regulates ignition timing using a sensor on the flywheel which measures the crankshaft's revolutions and position. The ignition signal is directed via a separate ignition amplifier, ignition coil and distributor to the spark-plugs. Additionally, the system can be used to generate a fuel consumption signal for a vehicle computer, etc.

Sensors, selectors and signals

- Throttle contact and/or throttle potentiometer – indicates the throttle's position, i.e. between idle and full load signal.
  In addition, systems which have throttle potentiometers are capable of sensing the throttle's position on part loading.
- Flywheel sensor – measures the number of crankshaft rotations with the help of the teeth on the flywheel. In addition the system determines top dead centre by means of an absent tooth.
- Air temperature sensor – measures the temperature of the inlet air.
- Knock sensor – used to adjust the iginition timing.
- Pressure sensor and air temperature sensor signals – the measured values are used to calculate how much air is drawn into the engine per revolution.
- Lambda sensor – measures the oxygen content of the exhaust fumes (only certain systems).
- In addition signals are received from a speed sensor, the starter motor and information about the position of an automatic gearbox's gear selector (P/N signal) on certain models.

Control functions

- Control of fuel pump and system relay.
- Control of lambda sensor pre-heating.
- Control of injection valves.
- Control of cold start valve.
- Control of idle valve for regulating idling speed.
- Control of ignition timing.
- Control of fuel tank ventilation.
- Control of wastegate on certain turbo models.
- Control of EGR – valve (exhaust gas recycling valve).

Information to other control units

The Fenix/Renix 35 can provide certain information to other control systems in the car (e.g. automatic gearbox):

- Information about the throttle potentiometer's position.
- Information about speed.
- Information about revolution rates to the tachometer.
- Information about fuel consumption.

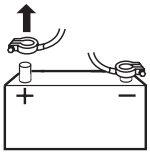
Users Guide

Connection of equipment

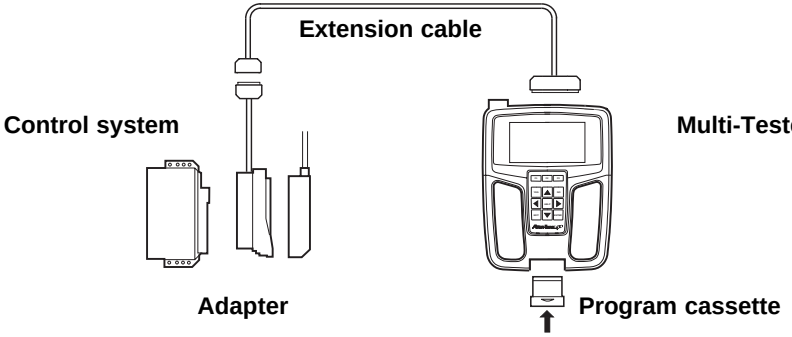
1. Preparations

Turn off ignition!

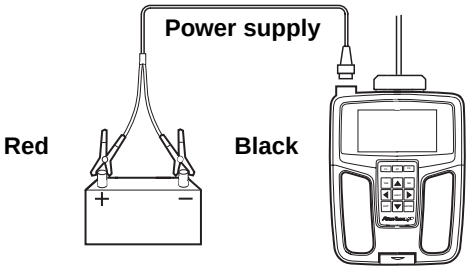
Disconnect positive battery terminal!



2. Connect adapter and program cassette



3. Connect power supply



Starting the program

General

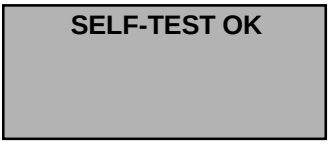
The program is re-started each time the power supply is interrupted and re-connected. When the supply is interrupted any faults and pre-sets recorded in memory are deleted.

At any particular moment, those keys which are not required are disabled. If such a key is pressed, the unit emits a long beep signal.

The program starts automatically when the Multi-Tester plus/pro is connected to the power supply. The unit executes steps 1 to 3 and pauses at step 5.

Working procedure

1. All fields in the display are tested (i.e. are illuminated) *(Multi-Tester plus only).*
If no software cassette is installed or the cassette is incorrect, only the first and third row become illuminated.
At this point the display's contrast can be adjusted. Adjust the potentiometer to right of the switch inside the cassette opening (using a small screwdriver).



2. The Multi-Tester plus/pro performs a self-test....

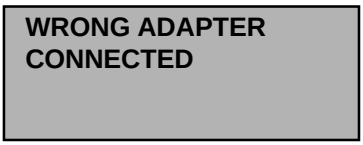
3. ...and identifies the current versions of the hardware and software.

4. Snapshots *(Multi-Tester pro only)*
If the instrument contains stored snapshots, a menu for managing these is displayed.

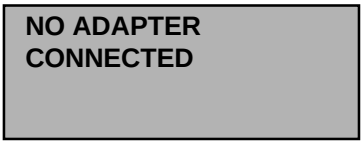
5. The adapter connected
The Multi-Tester plus/pro confirms which adapter is connected and displays this information.

Is the information on row 2 correct? Respond by pressing ENTER.

This message is displayed if the adapter which is connected to the Multi-Tester plus/pro is of the incorrect type, i.e. not combined with the appropriate software cassette.



If the adapter is not connected to the unit, the message NO ADAPTER CONNECTED is displayed.



VOLVO
RENAULT
PEUGEOT
↑/↓/ENTER

CITROEN

↑/↓/ENTER

B18E
B18EP/FP
B18U; B20U/F
↑/↓/ENTER

4 CYLINDERS
6 CYLINDERS

↑/↓/ENTER

TYPE SELECTION
MONO INJECTION ?

YES/NO

TYPE SELECTION
INTEGRATED
ISC ?
YES/NO

TYPE SELECTION
LAMBDA SENSOR ?

YES/NO

TYPE SELECTION
THROTTLE POT. ?

YES/NO

6. Questions during initialization

In order for the Multi-Tester plus/pro to perform the tests correctly it needs certain data on the system. The display shows either alternatives or questions.

Alternatives

Use the up or down arrow key to select the correct alternative and then press ENTER.

Questions

Answer the questions by pressing either the YES or NO key.

Prompts and menus which may appear on the display are shown on the right.

MONO INJECTION applies to Renault. The procedure depends on whether the car is equipped with normal or mono idle control (see fault tracing for the idle control, pin 23 and 24).

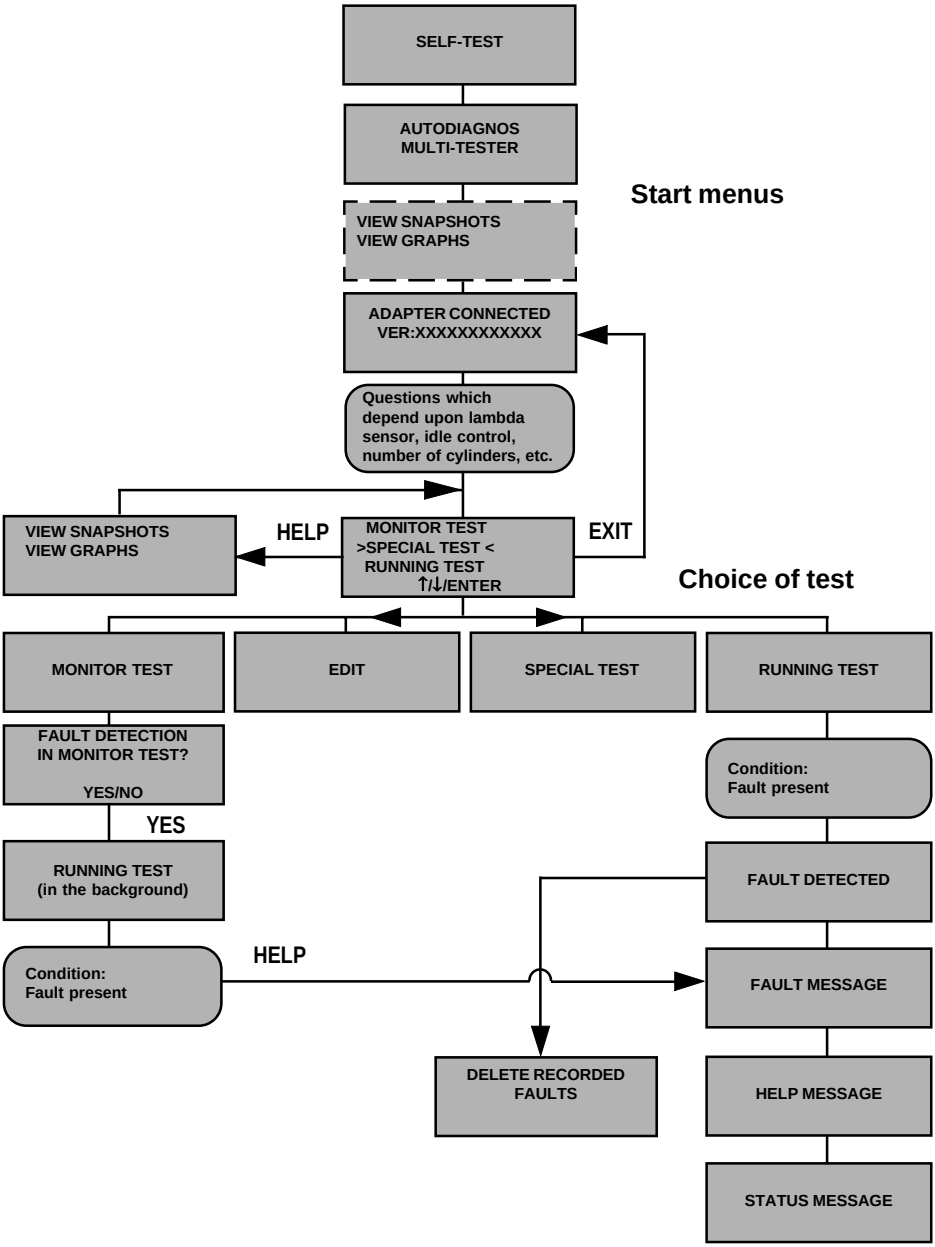
INTEGRATED ISC applies to Renault too. It determines whether the idle control uses both pins 23 and 24, or solely 23. This type of idle control is currently used on the Renault Laguna.

7. Cancel

To cancel work with the Multi-Tester plus/pro:

- Switch off engine.
- Disconnect the power cable from the unit.
- Disconnect the battery's positive terminal.
- Remove the adapter and re-connect the car's wiring harness to the control unit.
- Re-connect the battery's positive terminal.

Program structure



Programs and tests

The following types of test are available:

Monitor test Directs and displays the control system's signals without storing measured values.

Running test Records and stores faults which occur under both shorter and longer test periods.

Edit Can be used to disable fault detection on various signals.

Special tests A number of tests which are carried out in response to independent signals.

Monitor test

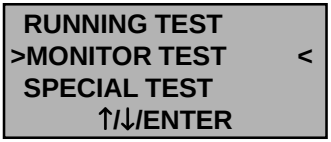
General
In Monitor test, values such as engine speed and coolant temperature are displayed.

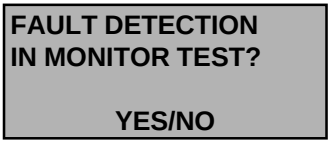
Monitor test – with fault detection
This test is used to detect incorrect input and output signals to/from the various control systems. An fault is recorded if a signal deviates from its pre-programmed standard value. The fault is recorded until it is deleted manually or the power supply is interrupted.

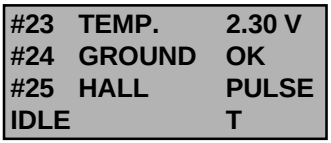
- Up to five faults can be recorded each time Running is executed.
- Each primary fault can lead to a number of secondary faults.
- The Multi-Tester plus/pro stores all faults (primary and secondary) temporarily and offers an assessment of which is the primary fault. This is important in order to carry out repair work. Fault information is saved and displayed.
- The same fault cannot be recorded twice in succession.
- Order of priority of fault registration:
  1. Power supply
  2. Frame connections to the control system
  3. Sensor signals which affect the basic functions of the engine
  4. Other signals

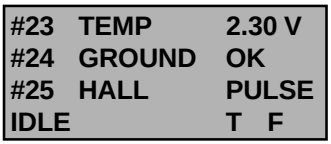
Warning! If the display is to be read whilst driving the test should be performed by two people.

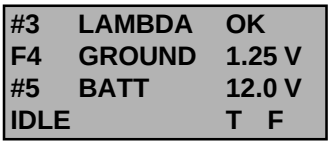
Monitor test

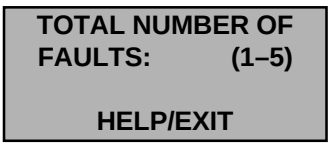












1. Monitor test
Select MONITOR TEST in the test choice menu.

2. Fault detection in Monitor test
Here you can select whether or not fault detection is run while in Monitor test. If you press YES, Running searches for faults while Monitor displays the values. If you press NO, START ENGINE shows. I you press ENTER, the list of signals is shown without the engine being started.

3. Test underway
A small **T** character flashes on the status row which indicates that the test is underway.

4. Fault detected
If an fault is detected, the unit emits a tone as well as a small **F** on the status row.

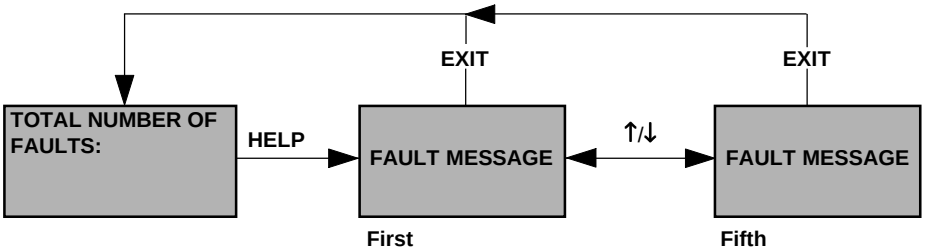
5. To inspect faults
If you press → the unit proceeds directly to the faulty signal. A small **F** character is displayed before the relevant pin number. If you select ← the unit proceeds to the beginning of the list of signals.

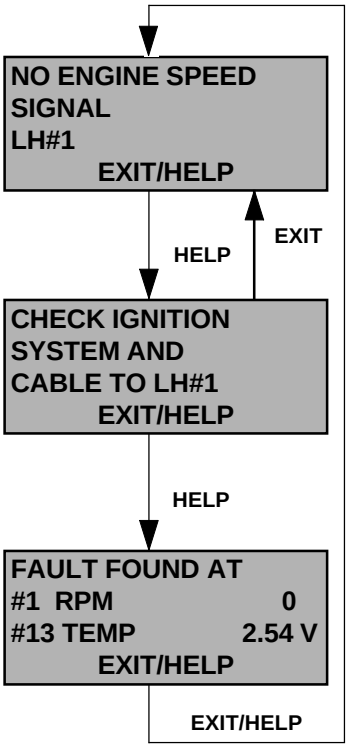
You can also press HELP to display which fault has been detected in simple text. If the engine is switched off, when Monitor is re-started, you must begin from stage 1 of this section.

Fault messages

Each fault has the following information associated with it:

- Fault message
- Help message
- Status message





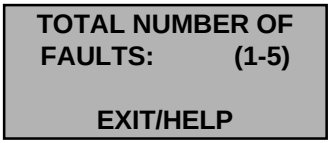
Example fault message for an LH control system.

Example help message.

Example status message.

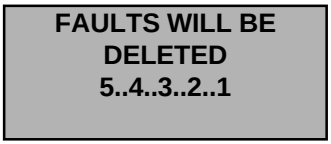
Display engine speed and voltage from coolant temperature sensor.

To delete recorded faults

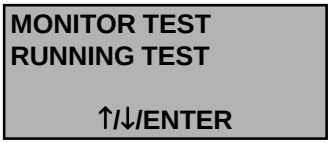


1. Start
To delete faults, start from this point.

2. To delete faults
Depress the EXIT key for at least 5 seconds. If EXIT is not pressed within 3 seconds the unit returns to the FAULT DETECTED message automatically.

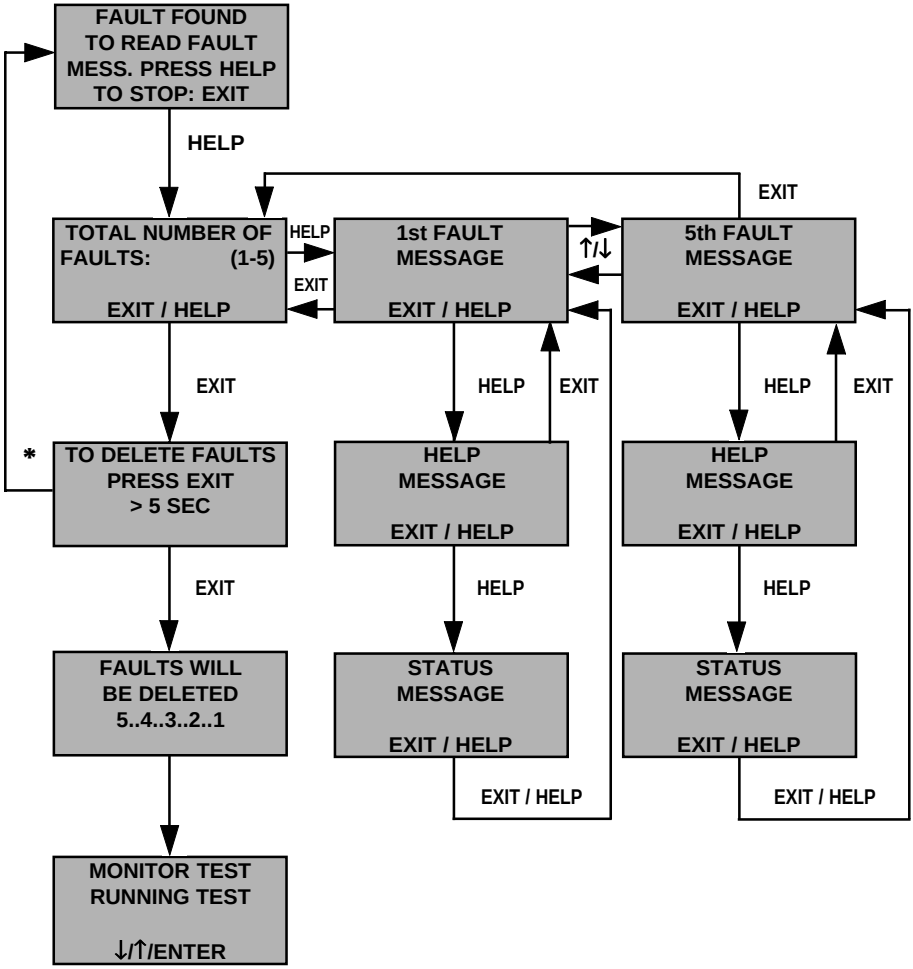


3. Delete faults.
All faults and all snapshots are deleted simultaneously.



4. Exit delete
When all faults have been deleted, the instrument returns to the “Choice of test” menu.

Fault detected



*** Occurs automatically after 3 seconds**

Snapshots (Multi-Tester pro only)

Automatic snapshots
When the Multi-Tester pro finds a fault, all the values in the monitor list are saved automatically as a snapshot. The Multi-Tester pro can store up to five snapshots. The number of snapshots stored is shown at the bottom of the display.

Certain parameters are displayed as mean values. Faults may be reported on the basis of instantaneous values, with the result that autosnap may not always display a faulty value even if the Multi-Tester pro indicates a fault on a particular signal.

Manual snapshots
Press ENTER to create a manual snapshot. Up to five manual snapshots can be stored. Here too, the number of snapshots stored is shown at the bottom of the display.

Viewing snapshots
To view snapshots, press EXIT, then HELP. Then move the cursor to VIEW SNAPSHOT with ↑/↓ and press ENTER. The manual snapshots appear first. The number of the current snapshot is shown at the bottom of the display. To view the next snapshot press →. Press EXIT to quit.

To delete manual snapshots, move the cursor to DELETE SNAPSHOT with ↓. Press ENTER, then YES.

Running test

General

This test is used to detect incorrect input and output signals to/from the various control systems. An fault is recorded if a signal deviates from its pre-programmed standard value. The fault is recorded until it is deleted manually or the power supply is interrupted.

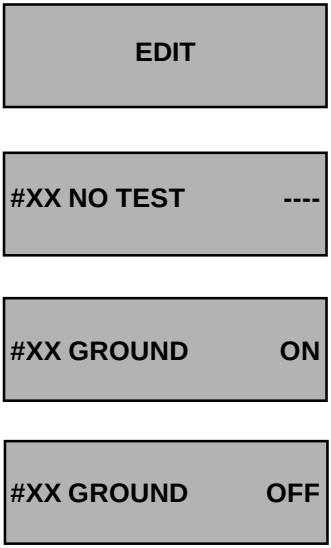
- Up to five faults can be recorded each time Running is executed.
- Each primary fault can lead to a number of secondary faults.
- The Multi-Tester plus/pro stores all faults (primary and secondary) temporarily and offers an assessment of which is the primary fault. This is important in order to carry out repair work. Fault information is saved and displayed.
- The same fault cannot be recorded twice in succession.
- Automatic test restart when the engine is restarted (appropriate for long-term tests).
- Signal values cannot be studied.
- Order of priority of fault registration:
  1. Power supply
  2. Frame connections to the control system
  3. Sensor signals which affect the basic functions of the engine
  4. Other signals

Warning! If the display is to be read whilst driving the test should be performed by two people.

An fault can be recorded the moment Running starts. The Multi-Tester plus/pro emits a beep and the letter **F** is displayed when an fault is detected. Instructions for retrieving the fault from memory together with a description of fault, help and status messages are described in the “Fault messages” section.

Edit

Edit can be used to turn off the error diagnosis for signals which for some reason are not connected to the interface. This may accur if you are testing a different year model of the car than the one that was available when developing the program for the actual control system.



At the start all signals are switched on. When the operator answers the introductory questions, Multi-Tester plus/pro shuts out non-relevant signals.

Error diagnosis for other signals can be switched on and off. Press ENTER to change the signal's status. When you press HELP, more information on the actual signal is displayed.

All changes will be erased when the Multi-Tester plus/pro is disconnected from power.

Note

If error diagnosis is disconnected, this can lead to other errors being reported. For example, if error diagnosis for a main ground or power supply is disconnected, then signals that depend on them can be reported as faulty.

Special Tests

Special tests allows detailed study of certain signals.

The following functions are provided for Special Tests.

Graphical display (Multi-Tester pro only)

- All signals that are presented in the form of voltage (V) in Monitor mode are displayed graphically.
- Press ↑/↓ to reach the required signal and press ENTER.
- To see all functions press HELP. To return, press any key.

  The timebase of the X-axis is shown bottom right on the display. It is marked with a black square. To reduce/increase the timebase, press ←/→. The shortest timebase is 2 seconds and the longest is 1024 seconds.

  The amount above the Y-axis indicates the scaling. Pressing F3 toggles the highlight between the scale factor and the offset bottom left on the display. Depending on which is highlighted, the setting is changed by pressing ↑/↓. The minimum and maximum values for the scaling are 200 mV and 15 000 mV, and for the offset 0 V and 14 V.

  The offset moves the curve in the Y-direction.

- Min/max is displayed top right on the display and applies to the curve currently displayed. When a snapshot has been taken, min/max is replaced by new values.

Snapshot (Multi Tester pro only)

There are two ways of taking a snapshot in graphical mode:

- Press F1. Curve drawing stops. Press ENTER to take a snapshot. To return, press F1 or F2.
- Press F2. A new curve is drawn to the end of the X-axis, where it stops. Press ENTER to take a snapshot. To return, press F1 or F2.

To view snapshots, press EXIT twice, then press HELP. Move the cursor to VIEW GRAPHS with ↑/↓ and press ENTER. The current snapshot and the number of snapshots stored are shown at the top of the display. Press → to view the next snapshot. Press EXIT to quit.

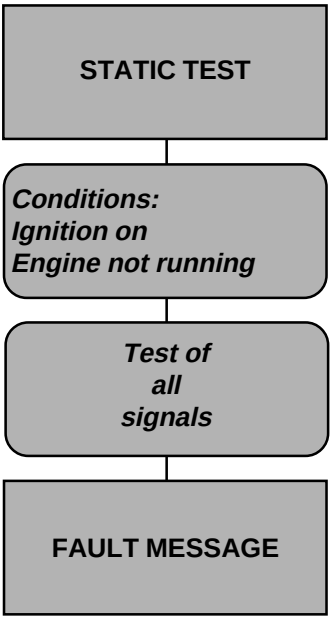
To delete graphical snapshots, move the cursor to ERASE GRAPHS with ↓. Press ENTER, then YES.

For the Fenix 35 system the following special tests are included:

>STATIC TEST	**Static test** This test checks the signals when the ignition is on but the engine is not running.
>CONT. STAT. TEST	**Continuous static test** Static test that is carried out continuously.
>THROTTLE TEST	**Throttle test** Tests the throttle potentiometer. Checks signal levels and continuity.
>IDLE SW. TEST	**Idle switch test** Tests the throttle switch.
>LAMBDA SENSOR	**Lambda sensor** Displays signal voltage from the lambda sensor and the minimum and maximum values.
>SENSOR POWER	**Sensor power** Displays the power voltage to sensors and the minimum and maximum values.
>THROTTLE POT	**Throttle potentiometer** Displays the signal voltage from the throttle potentiometer and the minimum and maximum values.
>AIR TEMP	**Air temperature** Displays the signal voltage from the air temperature sensor and the minimum and maximum values.
>COOLANT TEMP	**Coolant temperature** Displays the signal voltage from the coolant temperature sensor and the minimum and maximum values.

Manifold air pressure
Displays the signal voltage from the manifold air pressure sensor and the minimum and maximum values.

Battery
Displays the battery voltage and the minimum and maximum values.



Static test
Continuous static test

These tests detect incorrect input and output signals from the control unit when the ignition is on but the engine is not running.

A fault is registered if any signal differs from the pre-programmed standard value. The fault will be held in memory until it is erased manually or until the power is disconnected.

Starting conditions for the test:

- The ignition should be on.
- The engine should not be started.

  If the ignition is off, you will be asked to turn it on. If the engine is started the test will not be carried out and the program will return to the special tests menu.

After all the signals have been checked, the text NO FAULTS FOUND appears on the display. Or, if any faults are located, FAULT EXIST appears.

If the Continuous static test is selected, then all signals will be tested continuously until EXIT is pressed, the ignition is switched off or the engine is started.

If faults are found then this will appear on the display. To view these faults press HELP.

Note: On certain models, the terminal 15 signal remains up to 20 minutes after the ignition has been turned off if the engine has been running. The reason for this is that an extra water pump is run until the motor has cooled down sufficiently. You therefore need to press EXIT to end the Continuous static test.

Throttle test

This test involves a comprehensive check of the signal levels of the throttle potentiometer and the condition of the potentiometer carbontracks. For example, the test can detect signal interruptions that originate from a bad carbon track.

Starting conditions for the test:

- The ignition should be on.
- The engine should not be running.

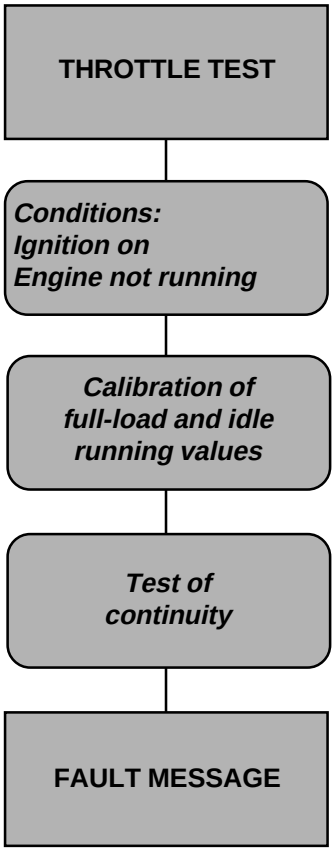
  If the ignition is off, you will be asked to turn it on. If the engine is started the test will not be carried out and the program will return to the special tests menu.

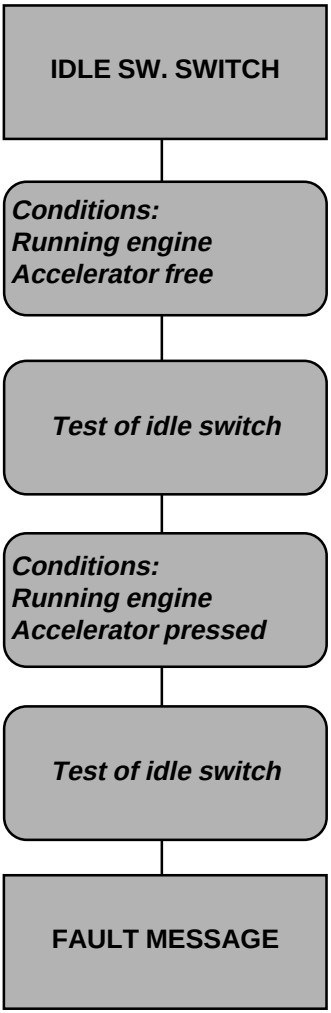
Firstly, the system calibrates the Multi-Tester plus/pro pre-programmed values for full-load and idle running. This is to guarantee the Multi-Tester plus/pro function as these values can vary between different vehicles. You will be asked to depress the accelerator fully, then to release it.

Then you will have to depress the accelerator slowly. The program then checks for signal interruptions from the throttle potentiometer.

If the accelerator is depressed too quickly during this part of the test, you will be asked to release it and slowly depress the accelerator again.

If faults are found then this will appear on the display. To view these faults press HELP.





Idle switch test

This test checks that the idle switch is functioning.

Starting conditions for the test:

- The engine should be running.

  If not, you will be asked to start it.

When the engine is started the idle switch will be checked for a few seconds. If necessary, you will be asked to release the accelerator. Then you will have to press down the accelerator for about 4 seconds, thus to open the idle switch.

After all the signals are controlled, the text NO FAULTS FOUND appears on the display or if any faults are located then FAULTS EXIST will appear.

Lambda sensor

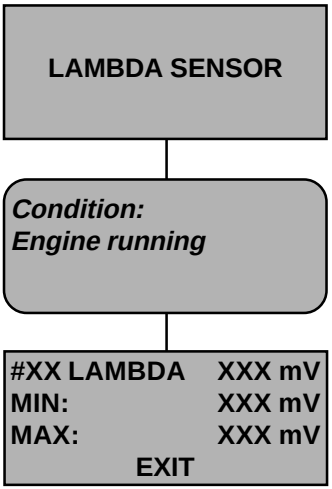
This test demonstrates the signal voltage of the lambda sensor.

The test displays the actual value together with the minimum and maximum values recorded. This makes it possible to check that the sensor is functional and oscillating between approximate extremes of 0 and 1 V.

Starting conditions for this test:

- The engine should be running. If not, you will be asked to start it.

This test will continue until EXIT is pressed or the engine is stopped.



Sensor power

This test demonstrates the power feed for the throttle potentiometers 1 and 2.

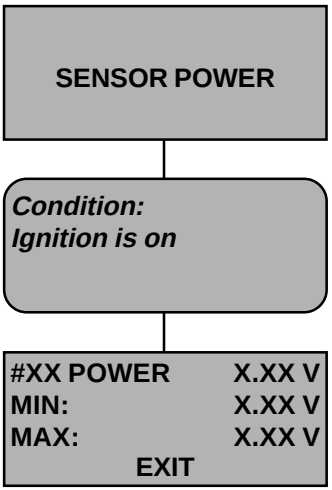
The test displays the actual value together with the minimum and maximum values recorded.

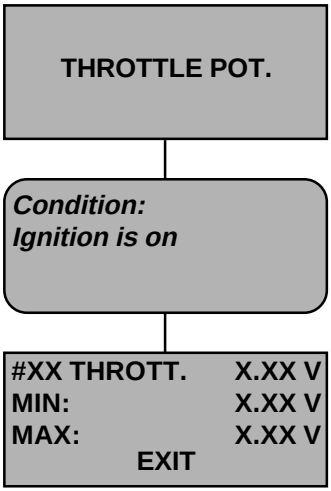
Starting condition for this test:

- The ignition has to be turned on.

  If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is turned off.





Throttle potentiometer

This test demonstrates the signal voltage of the throttle potentiometer.

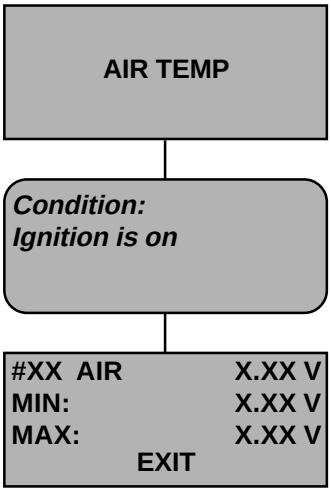
The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

  If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is turned off.



Air temperature

This test demonstrates the signal voltage of the air temperature sensor.

The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

  If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is turned off.

Coolant temperature

This test demonstrates the signal voltage of the coolant temperature sensor.

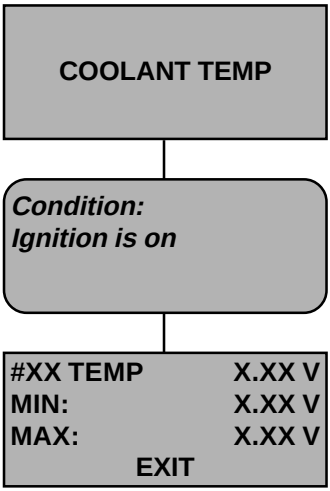
The test displays the actual value together with the minimum and maximum values recorded.

Starting condition for this test:

- The ignition has to be turned on.

  If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is turned off.



Manifold air pressure (MAP)

This test demonstrates the signal voltage of the manifold air pressure sensor.

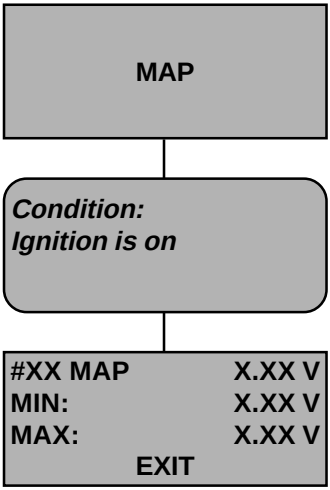
The test displays the actual value together with the minimum and maximum values recorded.

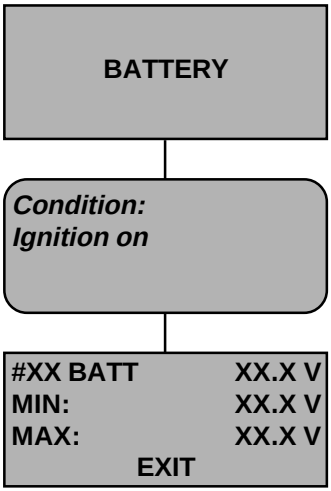
Starting condition for this test:

- The ignition has to be turned on.

  If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is turned off.





Battery

This test demonstrates the voltage level of the car battery.

The test displays the actual value together with the minimum and maximum values recorded. This enables the battery voltage to be measured during the starting phase, for example.

Starting conditions for this test:

- The ignition should be on. If not, you will be asked to turn it on.

This test will continue until EXIT is pressed or until the engine is stopped.

Trouble-Shooting Procedure

General

Many faults can be detected by using the Multi-Tester plus/pro (with the appropriate software cassette) only. As an additional aid, each software cassette has a dedicated troubleshooting manual.

However, when troubleshooting, the following points should be observed:

- Faults of intermittent character, e.g. faulty switch contacts, are often difficult to observe in the workshop. In such cases, those components which are considered potential causes of the fault should be swapped out, each in turn, followed on each occasion with a test drive with the Multi-Tester plus/pro connected.
- **NB:** the fault rate for control units is relatively low. More likely causes of failure are harness connectors, cabling, sensors or switches.
- Whenever resistance or voltage supply measurements are being taken at the harness connector by the control unit, the Autodiagnos Break-out Box (A0201/A0202) and associated Break-out Box adapter should be used to avoid destroying the harness connector's sheathing. This is to ensure good electrical contact and to avoid damage to or a short circuit across the harness connector's sheathing.

The troubleshooting manuals include two chapters important to trouble-shooting.

The *Fault Tracing* chapter includes a brief signal description for each pin and three columns (the pin number means the number in the control unit's harness connector). The three columns enumerate the quantities to be checked by the various tests. In the rightmost column the corresponding section in the *Locating Faults* chapter is also included (see figure below).

Pin 11 Signal from flywheel sensor

MONITOR	SPECIAL	RUNNING
"#11 CRANK" (PULSE/----)	Not tested.	Continuous pulse check. See chapter Locating Faults ▶8

In the *Locating Faults* chapter, the working procedure for locating faults is included.

Fault Tracing

Pin 1 Ground control unit

MONITOR	SPECIAL	RUNNING
"#1 GROUND" (OK/ERR)	Static test: ground check.	Continuous ground check. Desired value: approx 0 V

See chapter Locating Faults 1

Pin 2 Ground control unit

MONITOR	SPECIAL	RUNNING
"#2 GROUND" (OK/ERR)	Static test: ground check.	Continuous ground check. Desired value: approx 0 V

See chapter Locating Faults 1

Pin 3 Power from ignition switch (certain models)

MONITOR	SPECIAL	RUNNING
"#3 BATT" (ON/OFF)	Static test: voltage level check.	Continuous voltage level check. Desired value: approx 11-14 V

See chapter Locating Faults 2

Pin 4 Constant power from battery

MONITOR	SPECIAL	RUNNING
"#4 BATT" (OK/ERR)	Static test: voltage level check. Battery: display of voltage variation. Desired value: approx 11-14 V	Continuous voltage level check. Desired value: approx 11-14 V

See chapter Locating Faults 3

Pin 6 Control signal to pump relay

MONITOR	SPECIAL	RUNNING
"#6 RELAY" (ON/OFF)	Not tested.	Continuous check of control signal level. Desired value on operated relay: < 1 V See chapter Locating Faults ➧4

Pin 7 Control signal system relay

MONITOR	SPECIAL	RUNNING
"#7 RELAY" (ON/OFF)	Not tested.	Continuous check of control signal level. Desired value on operated relay: < 1 V See chapter Locating Faults ➧5

Pin 8 Full load signal from throttle contact (only measured on cars without throttle potentiometer)

MONITOR	SPECIAL	RUNNING
"# 8 FULLOAD" (ON/OFF)	Not tested.	Not tested.

Pin 9 Signal from throttle potentiometer (some models)

MONITOR	SPECIAL	RUNNING
"#9 THROTT" (V)	Throttle test: signal level and continuity check.	Continuous signal level and continuity check. Desired values for – idle: approx 0-1.2 V (some models have higher values) – full load: approx 4–5 V See chapter Locating Faults ➧6

Pin 10 Power to throttle potentiometer (some models)

MONITOR	SPECIAL	RUNNING
"#10 POWER" (OK/ERR)	Static test: voltage level check.	Continuous voltage level check. Desired value: approx 5 V

See chapter Locating Faults 6

Pin 11 Signal from crankshaft sensor

MONITOR	SPECIAL	RUNNING
"#11 CRANK" (PULSE/----)	Not tested.	Continuous pulse check.

See chapter Locating Faults 8

Pin 14 Signal from air temperature sensor

MONITOR	SPECIAL	RUNNING
"#14 I-AIR" (V)	Static test: signal level check.	Continuous signal level check. Desired value: approx 0.5-1 V at 20°C

See chapter Locating Faults 9

Pin 15 Signal from coolant temperature sensor

MONITOR	SPECIAL	RUNNING
"#15 TEMP" (V)	Static test: signal level check.	Continuous signal level check. Desired value for warm engine: approx 0.1-0.4 V

See chapter Locating Faults 10

Pin 16 Power to pressure sensor

MONITOR	SPECIAL	RUNNING
"#16 POWER" (V)	Static test: check of voltage level	Continuous check of voltage level. Desired value: approx 5 V See chapter Locating Faults 11

Pin 17 Ground to pressure sensor

MONITOR	SPECIAL	RUNNING
"#17 GROUND" (OK/ERR)	Static test: ground check.	Continuous ground check. Desired value: approx 0 V See chapter Locating Faults 12

Pin 19 Power from system relay

MONITOR	SPECIAL	RUNNING
"#19 POWER" (V)	Static test: voltage level check.	Continuous voltage level check. Desired value: approx 11-14 V See chapter Locating Faults 13

Pin 20 Control signal system relay (some models)

MONITOR	SPECIAL	RUNNING
"#20 RELAY" (ON/OFF)	Not tested.	Continuous check of control signal level. Desired value on operated relay: < 1 V See chapter Locating Faults 5

Pin 20 Control signal to injection valves (some models)

MONITOR	SPECIAL	RUNNING
"#20 INJ" (PULSE/----)	Not tested.	Continuous pulse check. See chapter Locating Faults 14

Pin 21 Control signal to injection valves

MONITOR	SPECIAL	RUNNING
"#21 INJ" (ms)	Not tested.	Continuous pulse check. See chapter Locating Faults 14

Pin 22 Power from ignition switch (some models)

MONITOR	SPECIAL	RUNNING
"#22 BATT" (ON/OFF)	Static test: voltage level check.	Continuous voltage level check. Desired value: approx 11-14 V See chapter Locating Faults 2

Pin 23 Control signal to idle speed correction valve (ISC)

MONITOR	SPECIAL	RUNNING
Not displayed.	Not tested.	Continuous pulse check. See chapter Locating Faults 15

Pin 24 Control signal to idle speed correction valve (ISC)

MONITOR	SPECIAL	RUNNING
"#24 ISC" (PULSE/----)	Not tested.	Continuous pulse check. See chapter Locating Faults 15

Pin 27 Control signal (tn) to ignition amplifier

MONITOR	SPECIAL	RUNNING
"#27 IGN" rpm	Not tested.	Continuous pulse check. See chapter Locating Faults 16

Pin 28 Signal from flywheel sensor

MONITOR	SPECIAL	RUNNING
"#28 CRANK" (PULSE/----)	Not tested.	Continuous pulse check. See chapter Locating Faults 8

Pin 29 Power from ignition switch (some models)

MONITOR	SPECIAL	RUNNING
"#29 BATT" (ON/OFF)	Static test: voltage level check.	Continuous voltage level check. Desired value: approx 11-14 V See chapter Locating Faults 2

Pin 32 Ground to knocking sensor

MONITOR	SPECIAL	RUNNING
"#32 GROUND" (OK/ERR)	Static test: ground check.	Continuous ground check. Desired value: approx 0 V See chapter Locating Faults 17

Pin 33 Signal from MAP sensor

MONITOR	SPECIAL	RUNNING
"#33 LOAD" (V)	Static test: signal level check	Continuous signal level check. Desired value for – idle: approx 1-2 V – when releasing the accelerator (engine braking): 0-0.5 V – full load: 4-5 V See chapter Locating Faults 18

Pin 34 Status signal from air conditioning (some models)

MONITOR	SPECIAL	RUNNING
"AC" (status)	Not tested.	Not tested.

Pin 35 Signal from lambda sensor (some models)

MONITOR	SPECIAL	RUNNING
"#35 LAMBDA" (mV)	Lambda: display of voltage variation.	Check of voltage variation. Conditions: – engine at operating temperature – not idle or full-load – rpm < 2500 See chapter Locating Faults 19

Pin 35 Signal from CO potentiometer (some models)

MONITOR	SPECIAL	RUNNING
"#35 CO-POT" (V)	Not tested.	Continuous signal level check. Desired value: approx 0-4 V See chapter Locating Faults 20

Locating Faults

1

Check of ground connection to Fenix/Renix, pin 1 and 2

These contacts are the control unit's ground connection.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance between the Break-out Box, pin 1 and 2, respectively and ground. Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

2

Check of power supply from ignition switch (terminal 15) to Fenix/Renix, pin 3, 22 or 29

This is an input signal to the control unit from the ignition switch. It indicates that the ignition is on.

1. Turn on the ignition and measure the voltage at the ignition coil's positive pole (terminal 15). Desired value: 12–14 V

   Possible cause of fault: Wiring, connectors or ignition switch.
2. Turn the ignition off and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between the Break-out Box, pin 3, 22 or 29 and the ignition switch, terminal 15. Desired value: approx. 0 Ω

   Possible cause of fault: Wiring or connectors.

Note

The terminal 15 supply provides the stop signal for the Multi-Tester plus/pro test program. This means that an absent signal is interpreted as a stopped engine. Nevertheless, a faulty signal will be detected at the start of the test.

3

Check of constant power supply from battery to Fenix/Renix pin 4.

This connection provides the control unit with a constant power supply from the battery to maintain retention of those presets the control unit has "learnt".

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between the Break-out Box, pin 4 and the battery's positive pole. Desired value: 0 Ω

   Possible cause of fault: Wiring, connectors or fuses.
3. Measure the voltage between the battery's positive pole and ground. Desired value: 12–14 V

   Possible cause of fault: Battery.

4

Check of control signal to fuel pump relay from Fenix/Renix, pin 6

This is a control signal from the control unit to the fuel pump relay. The signal is grounded to activate the pump relay after the engine has been turned over by the starter motor. There are several possible causes for an absent signal including:

- Discontinuity in the wiring or connectors.
- A defective or absent main input signal to the system, such as:
  - Power supply
  - Ground connection
- Faulty control unit, although this is most unlikely as the failure rate for control units is very low.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between the Break-out Box, pin 6 and fuel pump relay (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

3. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
4. Turn on the ignition and measure the voltage between fuel pump relay and ground. Desired value: 12 V

   Possible cause of fault: Wiring, connectors or fuel pump relay.

5

Check of control signal to system relay from Fenix/Renix, pin 7 or 20

This is a control signal from the control unit. The signal is grounded to activate the system relay. If there is no signal there may be several reasons:

- Discontinuity in the wiring or connectors.
- A defective or absent main input signal to the system, such as:
  - Ground connection
  - Power supply
- Faulty control unit, although this most unlikely as the failure rate for control units is very low.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between the Break-out Box, pin 7 alt. pin 20 and system relay (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

6

Check of signal from throttle potentiometer to Fenix/Renix, pin 9

This is an input signal from the throttle potentiometer to the control unit. The output signal varies in response to the throttle position. Two signal properties are tested; level and continuity.

Signal level fault

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.

/ Continued

2. Measure the resistance of the cable between the Break-out Box, pin 9 and throttle potentiometer (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

3. Measure the resistance of the cable between the Break-out Box, pin 10 and throttle potentiometer (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

4. Measure the resistance of the cable between the Break-out Box, pin 17 and throttle potentiometer (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

Continuity fault

1. Replace the potentiometer.
2. Repeat the test using the Multi-Tester plus/pro.

7

Check of power to throttle potentiometer from Fenix/Renix, pin 10

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between the Break-out Box, pin 1 and 10. Desired value: approx. 5 V

   Possible cause of fault: Wiring, connectors, throttle potentiometer or control unit.

8

Check of signal from crankshaft sensor to Fenix/Renix, pin 11 or 28.

This is an input signal to the control unit from the crankshaft sensor. The signal indicates engine speed and top dead centre.

1. Check the clearance between the sensor and the ring gear (see workshop manual) and that the cogs are clean.

2. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between the Break-out Box, pin 11 and 28, respectively and the crankshaft sensor.
   Desired value in both cases: 0 Ω

   Possible cause of fault: Wiring or connectors.
4. Measure the resistance between the Break-out Box, pin 11 and 28.
   Desired value: 0 Ω

   Possible cause of fault: Crankshaft sensor.
5. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
6. Start or crank the engine and check that pulses from crankshaft sensor are received at Break-out Box, pin 11 and 28, respectively (use oscilloscope or similar). If the engine does not start, the signal level is lower but will be displayed on the oscilloscope.

   Possible cause of fault: Sensor, dirt between cogs or gap between crankshaft sensor and flywheel.

9

Check of signal from air temperature sensor to Fenix/Renix, pin 14

This is an input signal to the control unit from the air temperature sensor (type NTC with a negative temperature coefficient).

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between the Break-out Box, pin 14 and the air temperature sensor (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
3. Measure the resistance of the cable between the Break-out Box, pin 17 and air temperature sensor (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

/ *Continued*

4. Measure the resistance between the Break-out Box, pin 14 and 17. Desired value: normally approx. 2-3 kΩ at 20°C. This value (the resistance of water temperature sensor) may vary and should be checked in the workshop manual.

   Possible cause of fault: Air temperature sensor.

10

Check of signal from coolant temperature sensor (NTC) to Fenix/Renix, pin 15

This is an input signal to the control unit from the coolant temperature sensor (type NTC with a negative temperature coefficient).

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between the Break-out Box, pin 15 and coolant temperature sensor (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
3. Measure the resistance of the cable between the Break-out Box, pin 17 and coolant temperature sensor (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
4. Measure the resistance between the Break-out Box, pin 15 and 17. Desired value: normally approx. 2-3 kΩ at 20°C. This value (the resistance of water temperature sensor) may vary and should be checked in the workshop manual.

   Possible cause of fault: Coolant temperature sensor.

11

Check of power supply to the MAP sensor from Fenix/Renix, pin 16

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between the Break-out Box, pin 1 and 16. Desired value: 5 V

   Possible cause of fault: Wiring, connectors, sensor or control unit.

12

Check of ground connection to pressure sensor from Fenix/Renix, pin 17

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between the Break-out Box, pin 17 and ground. Desired value: 0 V

   Possible cause of fault: Wiring or connectors.

13

Check of power feed from system relay to Fenix/Renix, pin 19

1. Turn on the ignition and measure the voltage between system relay, pin 4/30 and ground (see workshop manual). Desired value: 12–14 V

   Possible cause of fault: Wiring or connectors.
2. Measure the voltage between the system relay, pin 3/86 and ground (terminal 15). Desired value: 12–14 V

   Possible cause of fault: Wiring, connectors or ignition switch.
3. Measure the voltage between the system relay, pin 1/85 and ground (terminal 15). Desired value: approx. 15 V

   Possible cause of fault: Wiring, connectors or ignition switch.
4. Turn the ignition off and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
5. Measure the resistance of the cable between the Break-out Box, pin 19 and system relay. Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
6. Measure the resistance of the cable between the Break-out Box, pin 7 and system relay. Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
7. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

/ Continued

8. Turn on the ignition and measure the voltage between the Break-out Box, pin 19 and ground. Desired value: 12–14 V

   Possible cause of fault: System relay.

9. Check the control signal between the Break-out Box, pin 7 (or 20) and the system relay as in point 5 of this chapter.

Note
The terminal 15 supply provides the stop signal for the Multi-Tester plus/pro test program. This means that an absent signal is interpreted as the engine being stopped. However, a faulty signal will be detected at the start of the test.

14

Check of control signal to injection valves from Fenix/Renix, pin 20 or 21

This is an output signal from the control unit to the injection valves which controls fuel metering.

1. Turn on the ignition and measure the power supply to the injection valves. Desired value: 12–14 V

   Possible cause of fault: Wiring, connectors or fuel pump relay.

2. Check the opening pulse by measuring the voltage across the injection valves with a test lamp (measure from the rear of one of the connectors on any injector). At low rpm the lamp should flash; it should shine with even intensity at higher rpm. If incorrect:
   – disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
3. Turn on the ignition and repeat corresponding measurement between the Break-out Box, pin 20 and 21, respectively.
4. In the case of a suspected discontinuity between Fenix/Renix, pin 20 and 21, respectively and the injector, make the following measurement:
   – turn off the ignition and disconnect the connector from the control unit. Measure the resistance between the Break-out Box, pin 20 and 21, respectively and the terminal on the injector's connector (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.

Note
The test is disconnected during fuel cut-off.

Injector failure can also have a mechanical cause (lining, etc.). Such faults are not registered by the Multi-Tester plus/pro. In such a case, a flow check must be carried out on each injector.

15

Check of control signal to idle speed correction valve from Fenix/Renix, pin 23 and/or 24

The idling speed regulator valve (ISR or ISC) is controlled via an output signal from the Fenix/Renix control unit which affects a coil in the regulator valve. The frequency of the signal is 150 Hz and the pulse ratio varies between approx. 25% and 75%. When this value increases the rpm increases, for example when the motor is cold or when the AC compressor is on.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Disconnect the connector from the ISC valve. Measure the resistance of the cable between the Break-out Box, pin 23/24 and the connector (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
3. Measure the resistance between the valve's terminals.
   Desired value: 2–10 Ω

   Possible cause of fault: ISC valve.
4. Connect the ISC valve again. Start the engine and check if pulses appear on the Break-out Box, pin 23 and 24 (use oscilloscope or similar).

   Possible cause of fault: ISC valve or control unit.
5. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
6. Turn on the ignition and measure the voltage to idling speed regulator valve. Desired value: 12 V

   Possible cause of fault: Wiring, connectors or fuel pump relay.

/ *Continued*

The Fenix/Renix 35 also has another type of regulator valve in the Renault with mono injection. This type uses both pin 23 and 24. When it is used, the control unit adjusts the idling speed regulator valve when necessary by connecting either pin 23 or 24 (decreasing/increasing) to ground for a moment. With this kind of regulation, the throttle can be maintained at 1/2 gas when the motor is turned off. Faults with this idling speed regulator valve are not detected by Multi-Tester plus.

1. Start the engine. Measure the supply on the Break-out Box 35's pin 23 or 24 with an oscilloscope or similar and check for pulses as the load on the engine is varied by, for example, slipping the clutch.

   Possible cause of fault: Wiring, connectors or control unit.

16

Check of the control signal to the ignition amplifier from Fenix/Renix, pin 27

This is an output signal from the control unit to control ignition. The control unit emits ignition pulses which control the ignition amplifier. There are several possible causes of an absent signal:

- A discontinuity in the wiring or connectors.
- A defective or absent main input signal to the system such as:
  - Crankshaft sensor
  - Voltage supply
  - Ground connection
- A faulty control unit, although this is most unlikely as the failure rate for control units is very low.

1. Remove the contact on the ignition power amplifier. Turn on the ignition and measure the voltage between the contact's positive pole and ground connections. Desired value: 12 V

   Possible cause of fault: Ignition switch, wiring between contact´s pin 1 and terminal 15, wiring between contact´s pin 3 and ground or connector.

2. Turn off the ignition and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.

3. Measure the resistance of the cable between the Break-out Box, pin 27 and the ignition power amplifier's corresponding connector. Desired value: approx. 0 Ω.

   Possible cause of fault: Wiring or connectors.

4. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
5. Crank the engine and check if pulses are being received at the Break-out Box, pin 27 using a test lamp.

   Possible cause of fault: Flywheel sensor or control unit.

6. Connect the ignition amplifier contact and check with a test lamp that pulses are received at the ignition coil pin nr 1 (–) when the starter motor is turned over.

   Possible cause of fault: Circuit-breaker (possibly ignition amplifier), ignition coil or wiring on primary side.

7. A fault indicated on the signal from ignition amplifier can, due to the specific construction of this system also occur due to a faulty crankshaft sensor. See also trouble-shooting chapter no 8 "control of signal to crankshaft sensor" from Fenix/Renix, pin 11 and 28.

17

Check of ground connection to the knocking sensor from Fenix/Renix, pin 32

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) between the car's wiring harness and the control unit.
2. Start the engine and measure the voltage between the Break-out Box, pin 32 and ground. Desired value: 0 V

   Possible cause of fault: Wiring or connectors.

18

Check of signal from the MAP sensor to Fenix/Renix, pin 33

This is an input signal to the control unit from the manifold air pressure (MAP) sensor which indicates engine load.

1. Check that the vacuum hose is in good condition and is connected to the pressure sensor.

/ Continued

2. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
3. Measure the resistance of the cable between the Break-out Box, pin 16 and the corresponding terminal at the MAP sensor (see workshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
4. Measure the resistance of the cable between the Break-out Box, pin 17 and ground connection at the MAP sensor (see sorkshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
5. Measure the resistance of the cable between the Break-out Box, pin 33 and signalling circuit at the MAP sensor (see sorkshop manual). Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
6. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.
7. Start the engine and measure the voltage between the Break-out Box, pin 16 and ground. Desired value: 5 V

   Possible cause of fault: Sensor or control unit.

19

Check of signal from lambda sensor to Fenix/Renix, pin 35

This is an input signal to the control unit from the lambda sensor. It is only found on cars fitted with catalytic converters and is used for the fine adjustment of the ratio of fuel to air to approx. 1:14.6 (by weight). This ratio is called lambda = 1.

The following test conditions must be met as the Multi-Tester plus/pro checks that the lambda sensor signal level lies between 0 and 1 V:

- Engine temperature must exceed +70°C.
- The engine must not be idling – some sensors cool down after long periods of idling and oscillation ceases.
- The engine must not be at full throttle – the sensor signal then becomes constant at approx. 1 V.
- Fuel cut-off should not be activated – the sensor signal then becomes constant at approx. 0 V.
- Engine speed below 2.500 rpm.

1. Check the sensor's pre-heating (if fitted) by measuring the voltage at the sensor connector while the engine is running. Desired value: 12-14 V
2. Check the resistance in the heating coil by disassembling the connector for the pre-heater and measuring the resistance. Desired value: 2-20 Ω

   Possible cause of fault: Lambda sensor.
3. Run the engine until it reaches operating temperature and maintain engine speed at approximately 2.500 rpm. Execute the LAMBDA SENSOR special test and confirm that the lambda sensor signals fluctuate between 0 and 1 V. The signal should oscillate about once a second. Oscillations of longer duration indicate that the sensor may be polluted and should be replaced.
4. Turn off the ignition and disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
5. Measure the resistance between the Break-out Box, pin 35 and ground. If the reading is approximately 0 Ω the sensor has short-circuited and is no longer functioning. Repeat the measurement at the sensor connector to determine whether the short circuit is in the sensor or the cable between the sensor and the control unit.

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Check of signal from CO potentiometer to Fenix/Renix, pin 35

The control unit uses this input signal from the CO potentiometer to adjust the combustion index.

1. Disconnect the 35-pin connector from the control unit. Connect the Break-out Box (A0201/A0202) and the 35-pin adapter (A020202) to the car's wiring harness only. Do not reconnect the control unit.
2. Measure the resistance of the cable between the Break-out Box, pin 35 and the corresponding terminal on the CO potentiometer. Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
3. Measure the resistance between the CO potentiometer's ground terminal and ground. Desired value: 0 Ω

   Possible cause of fault: Wiring or connectors.
4. Connect the Break-out Box and the 35-pin adapter between the car's wiring harness and the control unit.

/Continued

5. Turn on the ignition and measure the voltage at the Break-out Box, pin 35. Check that the supply can be varied with the CO potentiometer. Remember to adjust the CO level after this check.

   Possible cause of fault: CO potentiometer or control unit.

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2. Ground control unit
3. Power from ignition switch (some models)
4. Constant power from battery
5. Fuel tank ventilation
6. Control signal to pump relay
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8. Full load signal from throttle contact (some models)
9. Signal from throttle potentiometer (some models)
10. Power to throttle potentiometer
11. Signal from crankshaft sensor
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17. Ground to pressure sensor
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19. Power from system relay
20. Control signal system relay (some models) or control signal to injection valves (some models)
21. Control signal to injection valves
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24. Control signal to idle speed correction valve (ISC)
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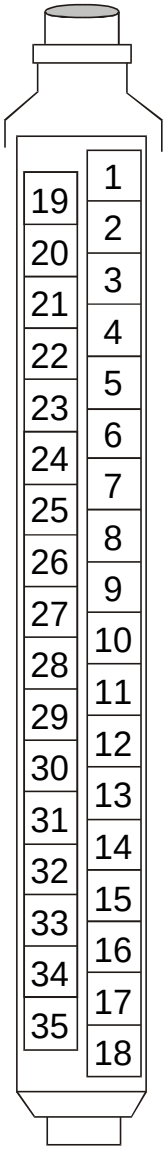
33. Signal from MAP sensor
34. Statussignal from air conditioning (some models)
35. Signal from lambda sensor (some models) or signal from CO-potentiometer (some models)

Note: Connector viewed from below

Wiring harness



Wiring Diagram

This wiring diagram is an example. Check in the relevant workshop manual for the diagram of the car model you are working with.